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STUDIES IN CRANIAL VARIATION.

FRANK RUSSELL.

THERE are a number of characters of infrequent occurrence in the human cranium that are said to have considerable importance as criteria of race. The morphological significance of some of them is not yet known. The present study is almost wholly statistical; it has been carried out upon a collection of Amerindian crania which are not so well known as those of Old World peoples. Nearly two thousand skulls in the Peabody Museum at Harvard University were examined. Many of these are in a fragmentary condition, so that the number available for the study of one character may be very different from that of another, *e.g.*, statistics relating to the metopic suture may be tabulated when the frontal bone alone is present, but those relating to the hard palate can be reckoned only upon skulls that are nearly complete.

Metopic Suture. — The median frontal suture (Fig. 1) closes normally in the infantile skull during the second year. It remains open throughout life, however, in a certain number of cases that is fairly constant for each of the main divisions of mankind. This percentage of open metopic suture varies widely in the different groups, as, for example, between Europeans (8.7 per cent) and Australians (1 per cent). The morphology of metopic crania has been exhaustively treated by Dr. Papillault,[1] who has shown that they are higher and broader, in a word have greater capacity than the normal. The percentage of occurrence of the metopic suture in the adult crania of the Peabody Museum collection is seen in the table on the following page.

Tympanic Exostoses. — There is a tendency in all races toward the formation of bony tumors or exostoses in the

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[1] Papillault, Dr. G. La suture métopique, etc., *Mém. Soc. d'Anth.*, T. ii, Sér. 3, fas. 1.

	NUMBER.	PERCENTAGE.
Eskimos	52	0
New England	68	2.9
Ohio and Tennessee	681	.8
California	160	1.9
Miscellaneous[1]	260	0
North America	1127	1.1
Peru[2]	458	1.1
Total[3]	1585	1.1

	NUMBER.	PERCENTAGE.	
"Peruvians"	565	3.5	(Anutchin)[4]
Amerinds	426	1.2	"
"	416	.7	(Harrison Allen)[5]

external auditory meatus. The tendency is increased in deformed crania, though it is now believed that such exostoses are not a necessary accompaniment of deformation; in support of this it will be noted that the small series of crania from New Mexico with pronounced occipital deformation exhibit not a single case of tympanic exostosis. I was somewhat surprised to find this condition of more frequent occurrence in the skulls from Ohio and Tennessee (Fig. 2) than in the deformed crania from Peru (Fig. 3). The exostoses varied in size from minute nodules to large tumorous growths and, in several instances, to complete occlusion of the external auditory meatus. Dr. Whitney has called attention to the fact that when one lip only of the tympanic ring is affected, it is commonly the inferior.

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[1] Including small collections from the Northwest, New York, New Jersey, New Mexico, and the territory occupied by the plains tribes. In subsequent tables the term "miscellaneous" will be applied to the last two groups.

[2] The localities from which the Peruvian crania in the Peabody Museum have come are Ancon, Casma, Grand Chimu, Amacavilca.

[3] Compare the results obtained by Anutchin and Topinard in their investigations upon European crania:

Europeans of both sexes 10.7810 skulls 8.7 per cent metopic (Anutchin).
Catacombs of Paris 10.000 " 9.91 per cent " (Topinard in his *Éléments d'Anthropologie Générale*, p. 793).

[4] Anutchin, D. N. Reviewed by M. C. Merejowsky in *Rev. d'Anth.*, T. vi, Sér. 2, p. 360.

[5] Allen, Harrison. Crania from the Mounds of the St. John's River. *Journ. Acad. Nat. Sci.*, Philadelphia, New Series, vol. x, No. 4.

Frontoparietal. — To economize space I have combined some of the characters in the tables; the somewhat rare anomaly known as the frontoparietal (Figs. 4, 5) may be placed here for convenience.

	TYMPANIC EXOSTOSES.		FRONTOPARIETAL.	
	Number.	*Percentage.*	*Number.*	*Percentage of Occurrence.*
Eskimos	51	0	52	1.9
New England	64	0	64	0
Florida	58	5·2	57	0
Ohio and Tennessee . . .	456	15.1	468	1.1
New Mexico	22	0	22	0
California	158	1.2	159	0.
Miscellaneous	66	3·	62	1.6
Mexico	47	8.5	52	0
North America	865	9·2	884	·7
Peru (Ancon, Arica), etc. . .	447	5·4	449	.2
Total	1312	7·9	1333	·5

Parietal Foramina. — As these foramina are exceedingly variable, statistics relating to them, while difficult to procure, should be of considerable interest. Observations were made to determine whether any significance attached to their occurrence on the one side or the other, but as none appeared I have disregarded this in the table; "present" may mean on one side or on both. Owing to the fact that the foramina are frequently present, yet of extremely small size, and that the condition of many skulls obscures this character, it was found to be almost impossible to obtain accurate data. However, the table will be found to be very nearly correct. Enlarged foramina were discovered in only one group — three cases among crania from the aboriginal cemetery at Madisonville, Ohio.

Epactal Bone. — It is difficult to tabulate the variations occurring in the size and shape of supernumerary occipital

	Number.	Percentage Present.
Eskimos	52	61.5
New England	63	47.6
Florida	56	44.7
Ohio and Tennessee	515	50.3
New Mexico	21	61.9
California	158	67.1
Miscellaneous	61	54.1
Mexico	54	62.9
North America	928	53.8
Peru	447	70.3
Total	1375	59.2

bones. The true interparietal, the composite and incomplete epactals may be distinguished with tolerable certainty, but the smaller bones at the apex of the occipital are not so readily identified. Following Washington Matthews,[1] I have considered all Wormian bones at the lambda as falling in the class designated *os triquetrum seu apicis.*

	Number.	Percentage.				
		Complete.	*Composite.*	*Incomplete.*	*Os quadratum.*	*Os triquetrum seu apicis.*
Eskimos	49	4.0	0	0	0	2.0
New England	66	3.0	0	0	0	0
Florida	62	4.9	1.6	0	0	11.7
Ohio and Tennessee	581	4.1	.9	.2	.5	3.1
New Mexico	21	0	0	0	0	0
California	159	1.9	0	0	1.2	4.7
Miscellaneous	69	0	2.8	0	0	13.0
Mexico	57	1.8	1.8	0	0	12.3
North America	1005	3.3	.9	.1	.5	13
Peru	451	1.8	1.8	.5	1.1	21.5
Total	1456	2.9	1.2	.3	.7	15

It will be observed that the complete or true interparietal bone occurs more frequently among North American tribes than among Peruvians. This is in harmony with the results obtained by Dr. Matthews from an examination of Cibolan (New Mexican) crania. Professor Boas informs me that some northwest coast tribes exhibit a high percentage of occipital anomalies. Compare Anutchin's[1] tables with the above.

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[1] The Human Bones in the Hemenway Collection, *Mem. Nat. Acad. Sci.*, vol. vi, p. 198.

	Number.	Complete.	Os Quadratum.
Amerinds "except Peruvians" . .	390	1.30	.26
"Peruvians"	664	5.46	1.05

As Anutchin's observations were made upon crania that were less uniformly deformed, they were probably in part of another tribe. This illustrates the desirability of abandoning the loose and unscientific term "Peruvians."

Platybasic Crania. — Occasionally a skull is found that has the occipital condyles and adjoining portions of the base thrust upward, as it were, into the cranial cavity. Presumably due to a greater or less degree of yielding of the floor of the calvaria to weight and muscular tension, it naturally occurs in all stages of development, according to the conditions. It is, therefore, difficult at times to distinguish between normal and platybasic crania; Topinard describes three varieties. Only well-marked examples are here noted. The results so far as they go seem to show that no relation exists between this condition and either cephalic index or artificial deformation. The highest percentage of occurrence is found among the Eskimos, who have the largest cranial capacity, but the number of skulls is too small to attach much significance to this.

Jugular Process. — The above table includes statistics concerning this somewhat rare anomaly, in which the process is enlarged until it extends beyond the plane of the condyles (Fig. 6). It is homologous with the paramastoid of the dog, etc. It occurs about once in one hundred crania from Peru and somewhat less frequently in North America.

Aymará Fossa. — Particular interest attaches to this character (Figs. 7, 8), owing to its supposed frequency of occurrence in the crania of criminals. As the fossa is very variable in

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[1] *Rev. d'Anth.*, T. vi, Sér. 2, p. 143.

	PLATYBASIC CRANIA.		JUGULAR PROCESS.	
	Number.	*Percentage.*	*Number.*	*Percentage.*
Eskimos	49	6.1	48	2
New England	51	2	45	0
Florida	55	0	38	0
Ohio and Tennessee	477	.2	359	.5
New Mexico	21	0	21	4.8
California	158	.6	155	0
Miscellaneous	57	1.7	55	0
Mexico	52	0	48	2.1
North America	871	.5	721	.5
Peru	447	0	439	.9
Total	1318	.3	1160	.7

depth, care must be exercised, and it is practically impossible to wholly eliminate the "personal equation"; only cases in which an actual concavity exists are here noted. While it is of slightly more frequent occurrence among the crania from the coast of Peru than in those from the northern continent, it will be observed that it is by no means confined to southern tribes, as is shown by the high percentage among the Eskimos.

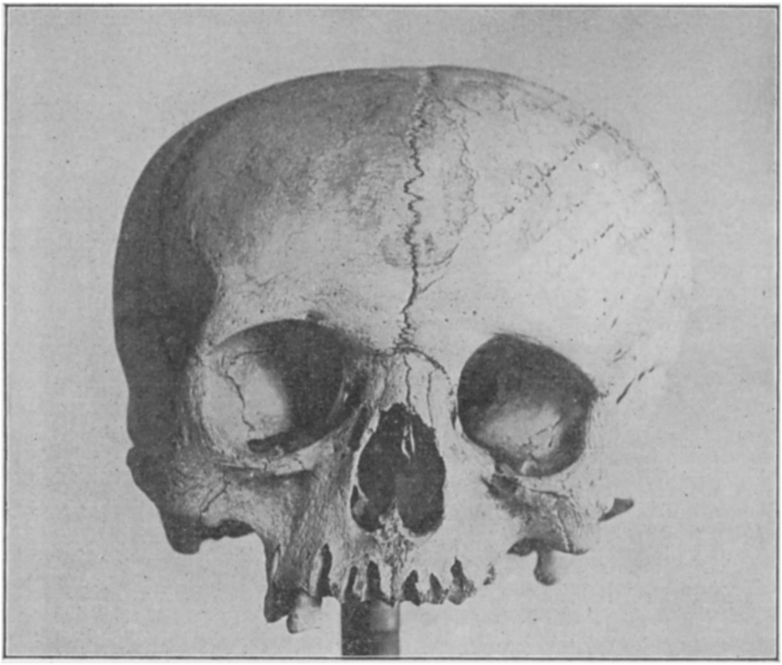
	AYMARÁ FOSSA.		FUSED ATLAS.		TORUS PALATINUS.	
	Number.	*Percentage.*	*Number.*	*Percentage.*	*Number.*	*Percentage.*
Eskimos	49	10.2	48	0	43	18.6
New England	50	6	46	2	48	8.3
Florida	47	8.5	36	0	8	0
Ohio and Tennessee	425	3.7	358	.8	377	19.1
New Mexico	21	0	21	0	21	9.5
California	158	3.8	155	0	158	11.4
Miscellaneous	55	1.8	54	0	51	7.8
Mexico	47	6.4	47	0	42	4.7
North America	803	4.1	717	.6	704	14.4
Peru	437	5.9	438	.2	436	.2
Total	1240	4.8	1155	.4	—	—

Fused Atlas. — As might be expected, the Ohio-Tennessee collection contained several skulls having their condyles firmly joined with the atlas, sometimes resulting in the almost complete absorption of the latter. Crania and skeletons from that region exhibit a large percentage of all kinds of malformations — atavistic, artificial, and pathological.

Torus Palatinus. — This hyperostosis of the middle line of the hard palate is most pronounced in the Eskimo crania. It was slightly more frequent in the Ohio collection (Fig. 9), though the ridges were not so large. With the exception of these two groups, this anomaly appears to be fairly uniformly distributed in North America. The number of skulls from Florida upon which this character could be noted is so small that it would be extremely hazardous to assume southern affinities for this group, because it resembles those of South America, where the percentage of occurrence of this anomaly is so low that I have not combined it with that of North America to form a total for the race. The Florida series also stands apart from all others studied in having a larger percentage of "pterion in K."

In addition to the above characters, observations were made to determine the percentage of occurrence of the infraorbital suture, right and left; of "pterion in H," etc.; as to whether the malar entered the spheno-maxillary suture; the number of bipartite malars (one case to the thousand skulls); and concerning the morphology of an anomalous process at the basion that was found three times in the whole collection. However, I have regarded these characters, somewhat arbitrarily perhaps, of less interest than those considered above and shall not publish the data relating to them.

I hope that the facts presented may prove suggestive and interesting, but do not expect them to establish firmly any hypotheses regarding the origin or affinities of the Amerinds.



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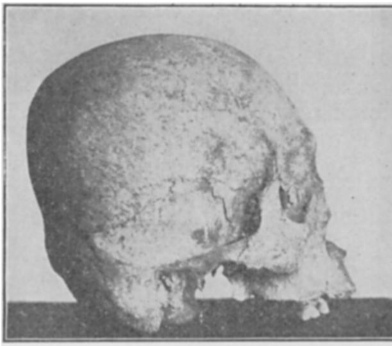

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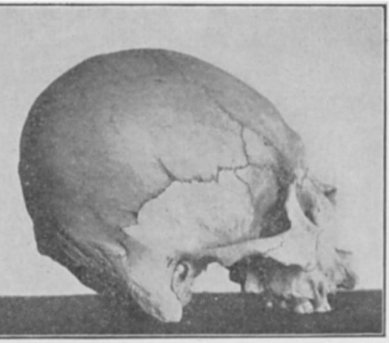

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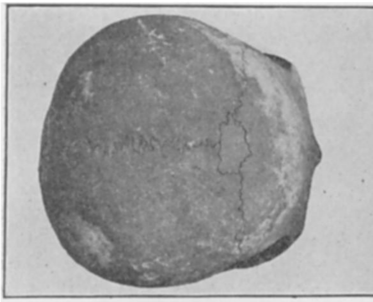
FIG. 1 — Metopic suture. Grand Chimu, Peru. Cat. No. 480.
FIG. 2. — Tympanic exostoses. Ancon, Peru. Cat. No. 23,407.
FIG. 3. — Tympanic exostoses. Stone Grave, Nashville, Tennessee. Cat. No. 12,802.



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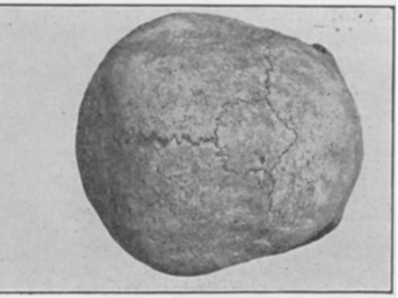

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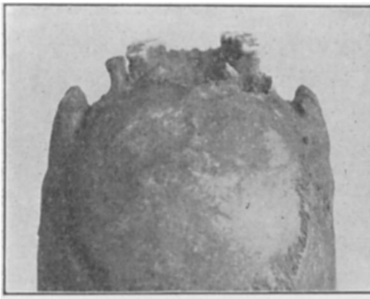

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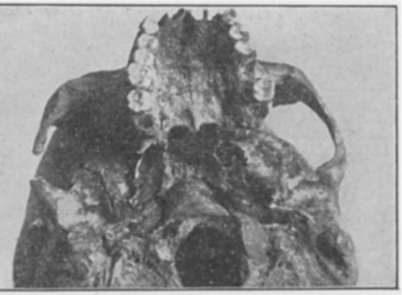

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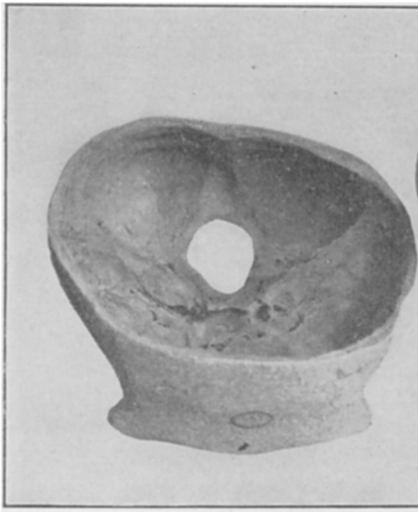

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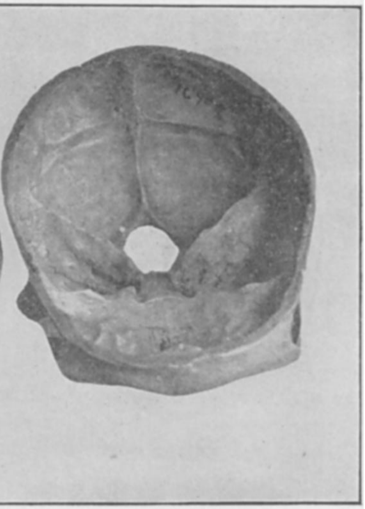

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Figs. 4, 5. — Frontoparietal. Stone Grave, Nashville, Tennessee. Cat. Nos. 2600, 17,314.
Fig. 6. — Jugular process. Lynville, Wisconsin. Cat. No. 11,252.
Fig. 7. — Interior of white skull, showing normal internal occipital crest.
Fig. 8. — *Aymará fossa.* Casma, Peru. Cat. No. 447.
Fig. 9. — *Torus palatinus.* Stone Grave, Nashville, Tennessee. Cat. No. 18,280.